Analysis of Polyaniline

Application Note

Materials Testing & Research, Polymers

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Introduction

The Agilent PLgel 5 µm MIXED-D column is specifically designed for the analysis of polymers, paints and resin systems where material above 400,000 MW is unlikely to be present. These columns are ideal for the analysis of polyanilines.

Polyaniline exists in two forms: the emeraldine form, which contains alternating secondary amines and imine groups, and the leucoemeraldine form, which contains only secondary amines. The emeraldine polymer is semi-conjugated and so is an intense blue color and is of interest as a polymeric dyestuff (the leucoemeraldine is colorless). The analysis of polar polymers, such as polyaniline, requires the use of polar organic solvents as eluents, for example: dimethylformamide, dimethyl sulfoxide and N-methyl-2-pyrrolidinone (NMP). Often these solvents require high temperature GPC, due to their increased viscosity compared to tetrahydrofuran, and the addition of salts reduces interactions between the polymer and the column packing material.

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A sample of the emeraldine form was dissolved in the eluent to produce a solution at 0.05% (w/v) and left for 12 hours to dissolve. Any undissolved material was removed from the sample by filtration through a 0.45 µm syringe filter prior to injection.

The figure shows a chromatogram of the emeraldine polyaniline. The polymer elutes as a broad distribution after about 12 minutes.

Conditions

Columns:	2 x PLgel 5 µm MIXED-D, 300 x 7.5 mm (part number PL1110-6504)
Eluent:	NMP + 0.1% (w/v) LiBr
Flow Rate:	1.0 mL/min
Injection Volume:	100 µL
Temperature:	80 °C

High pore volume combined with the 5 µm efficiency provides excellent resolution for low MW polymers and oligomers. Two, or even three, PLgel 5 µm MIXED-D columns are the perfect replacement for the popular 10^4/500 Å or 10^4/10^3/500Å/100Å column combinations.

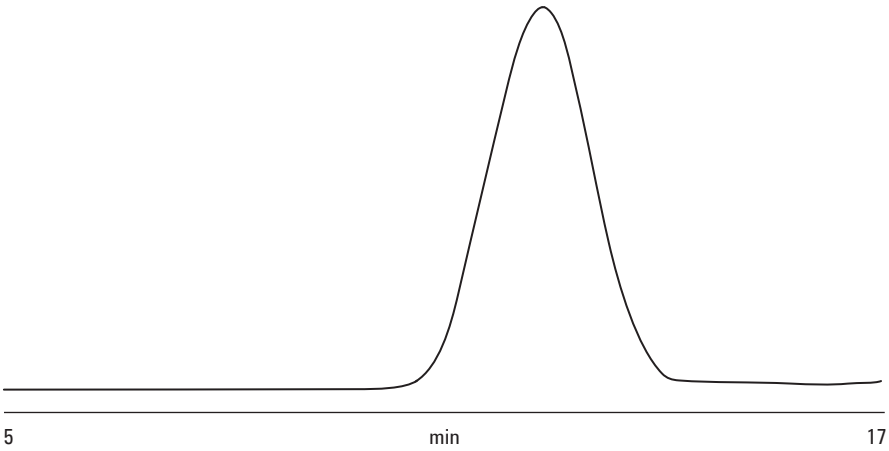

Figure 1. Analysis of emeraldine polyaniline using PLgel 5 µm MIXED-D columns

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